CS271 Spring 2021 Computer Graphics II HomeWork 4

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Problem 1: Mesh Info Display

Package and Environment

- The convex hull algorithm is realized using language **C++**
- The project only uses the **GLUT** library as provided.
- Follow the instructions (https://piazza.com/class/kl8wmh1uda82ps?cid=29) on Piazza if **GULT** is not available on your computer

Instructions

- If you use command lines **(Windows Powershell recommended)**
  - First Enter the `BUILD_EXE` folder in the terminal window
  - then run the EXE with `.\pa1.exe ..\models\{THE_OBJ_FILENAME}`
  - (`./pa1.exe ../models/{THE_OBJ_FILENAME}` in Linux based system maybe, I haven't tried)
  - For example, if you want to check model **bu.obj**, simply type `.\pa1.exe ..\models\bu.obj`
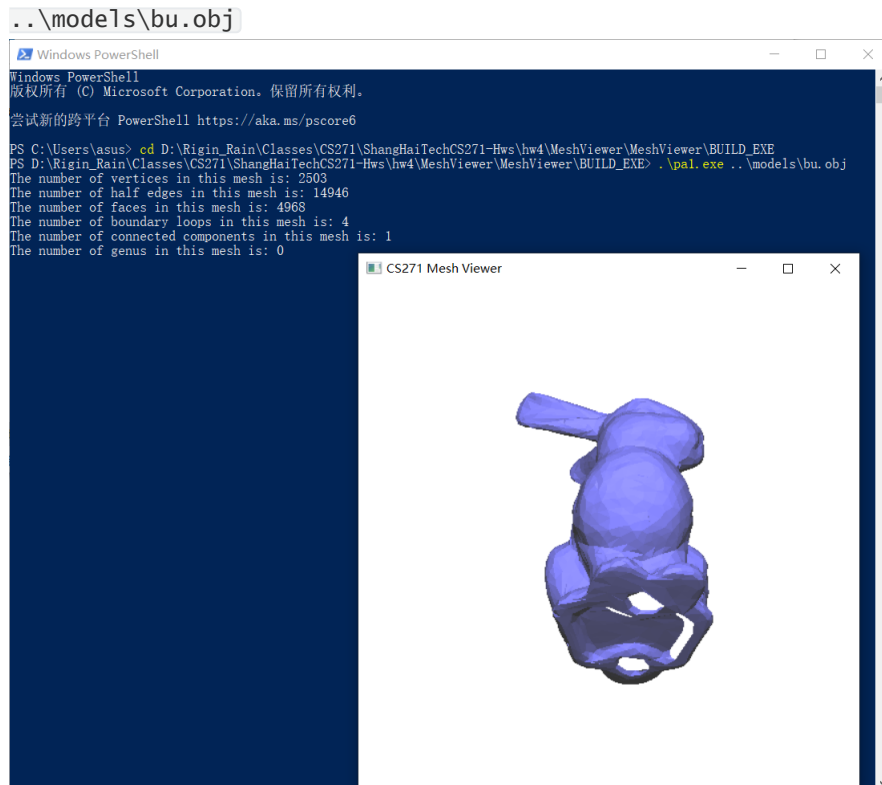
- If you use visual studio (2017) to open the pa1.sln

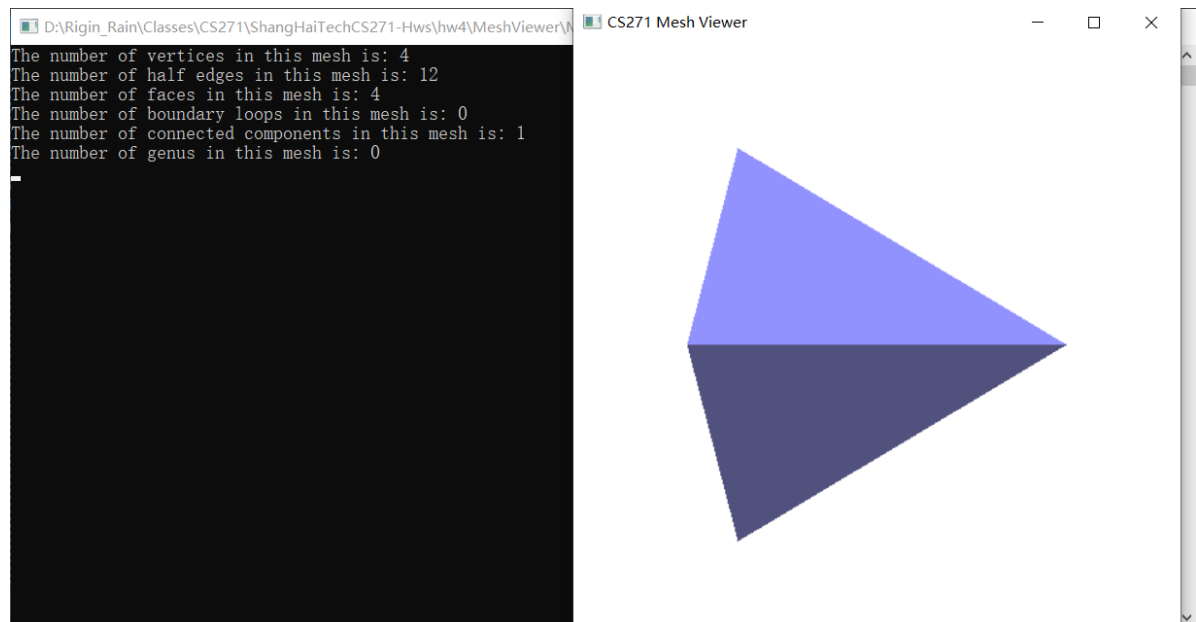- In **Project -> pa1 Properties... -> Debugging**, Set **Command Arguments** to `models\{THE_OBJ_FILENAME}`.
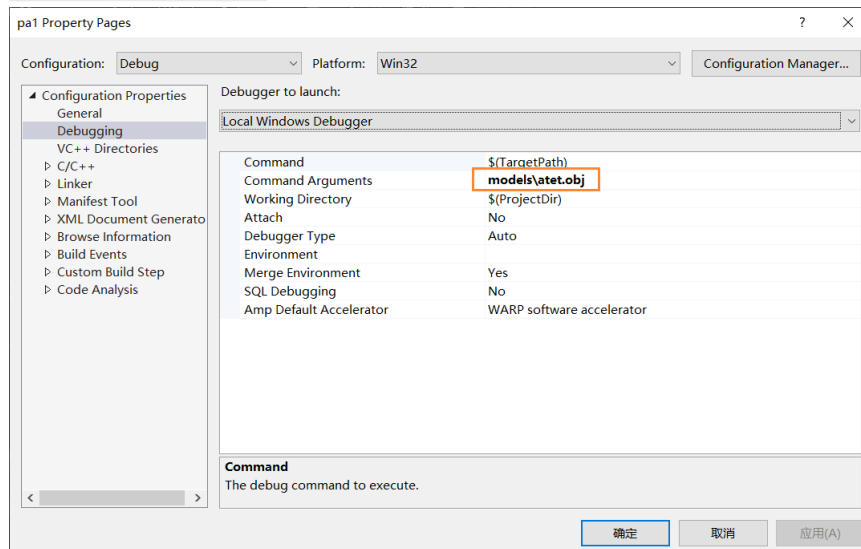
- For example, if you want to check model **bu.obj**, simply write in `models\bu.obj`
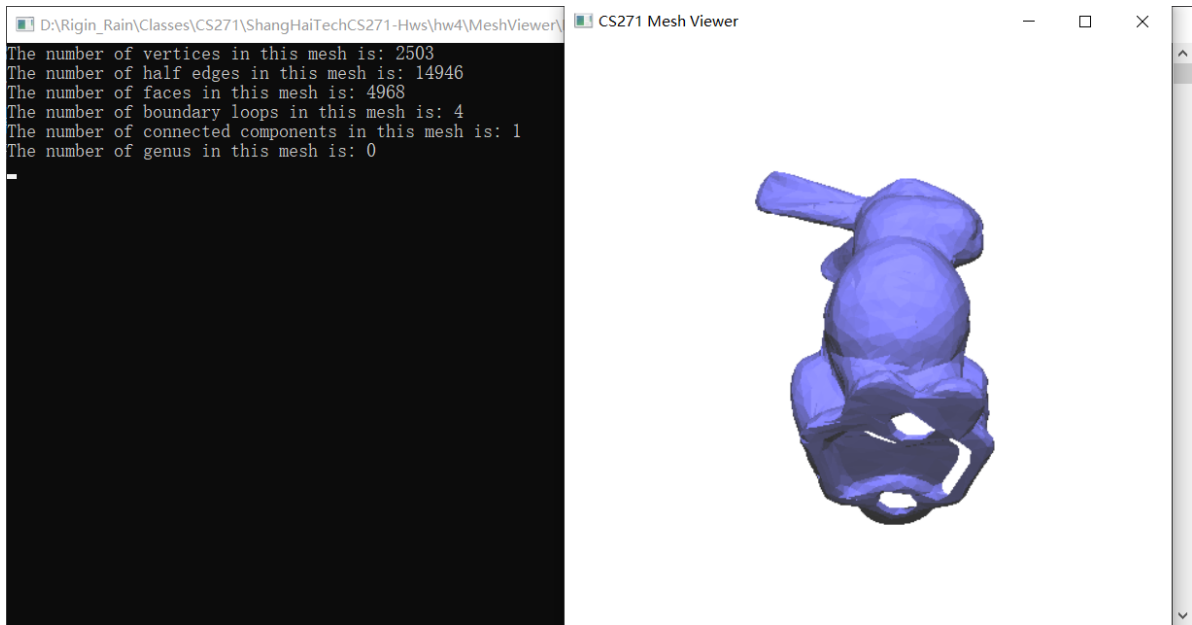
Output

- It will output in console with **lines** of information of the mesh, containing the number of vertices, half-edges (including boundary edges and their twin edges), faces, boundary loops, genus and connected components.
- It will output a window displaying the mesh, drag left mouse button to rotate and hold on to middle mouse button and drag to scale.

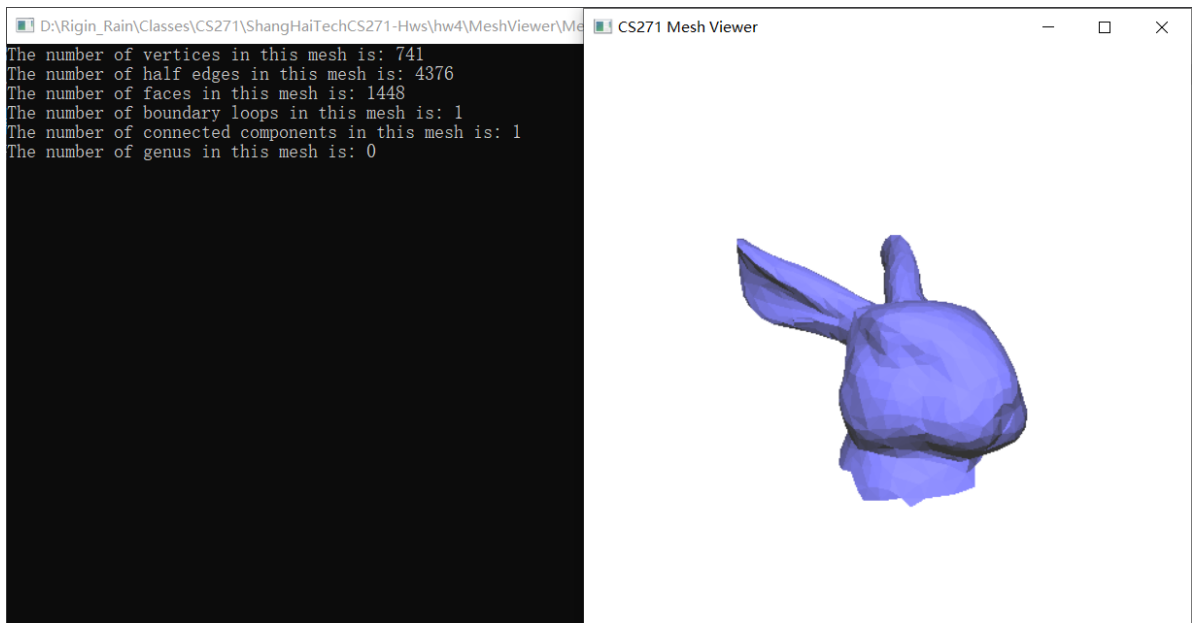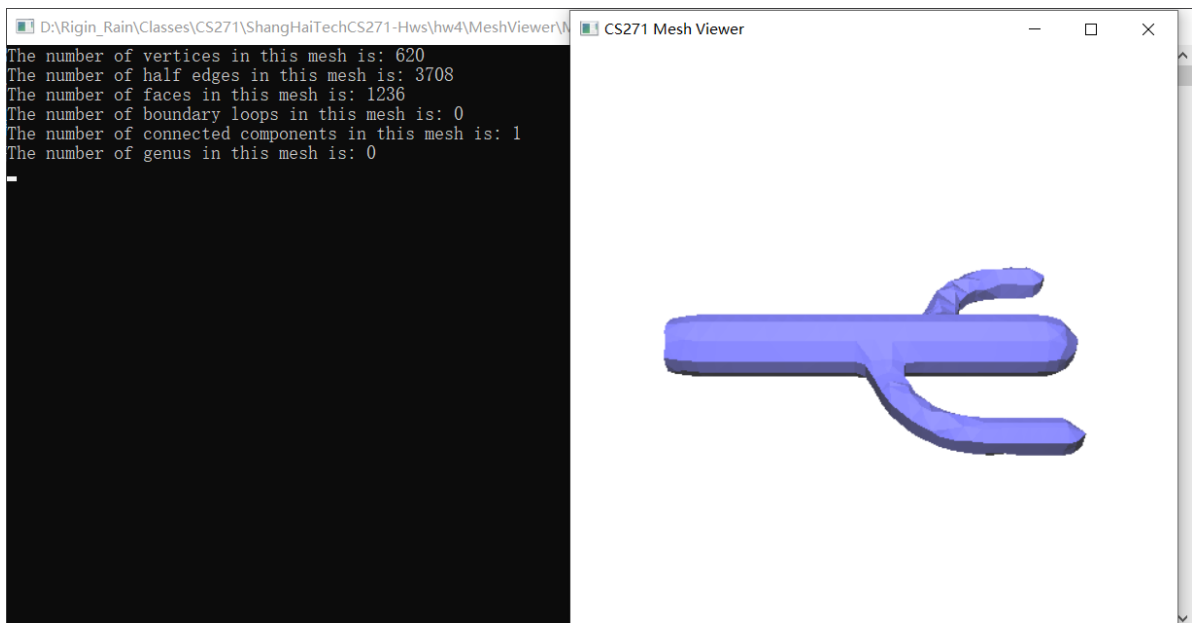**Results(Some models are adjusted to have a better view)**
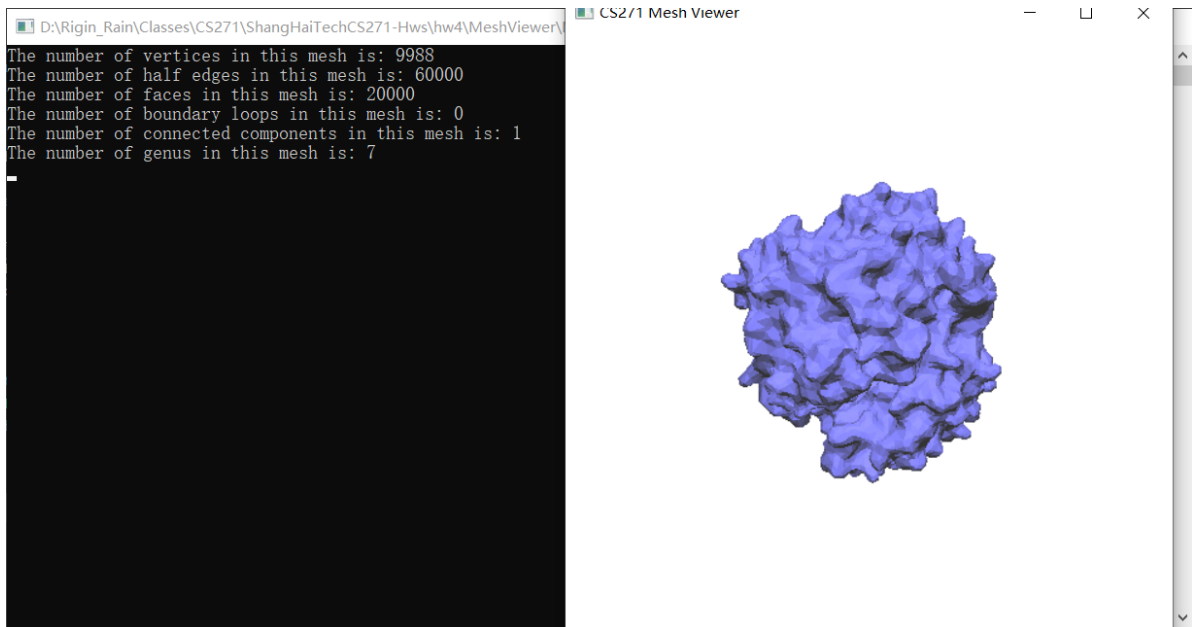
- For atet.obj
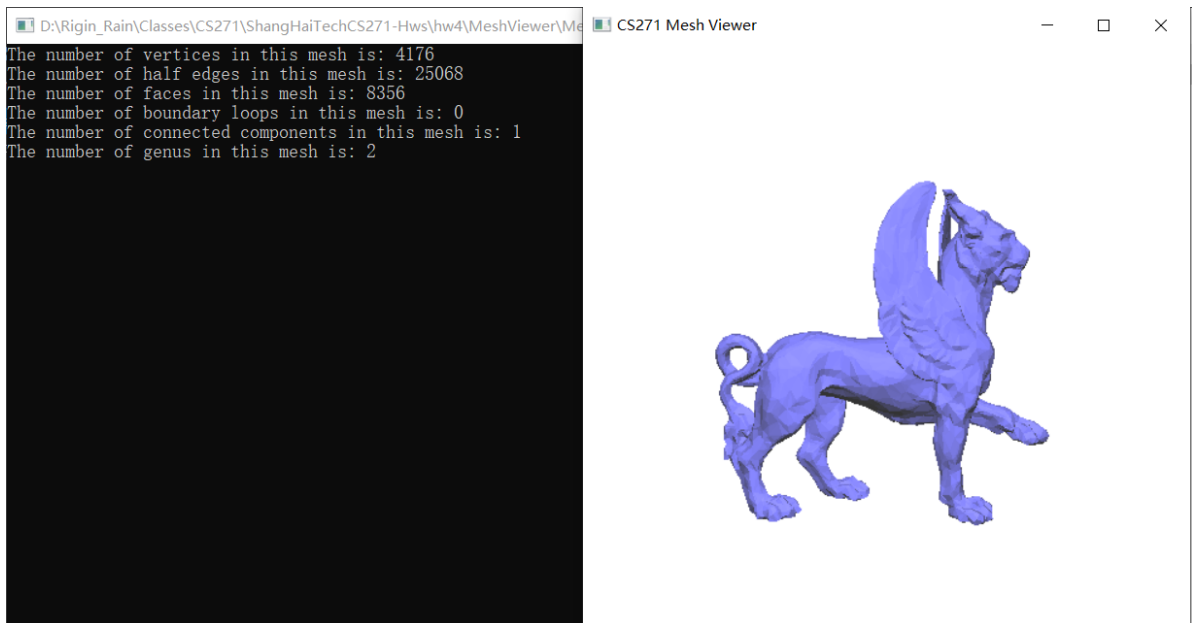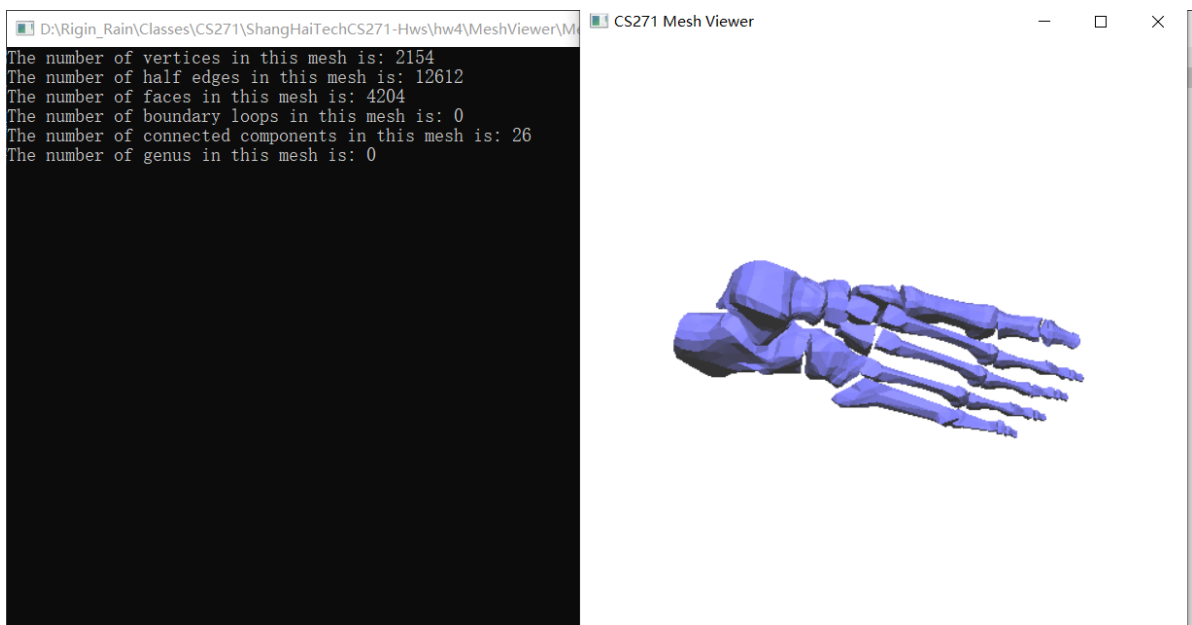

- For bu.obj

- For bu_head.obj

- For cactus.obj

- For deo10k.obj

The number of vertices in this mesh is: 9988
The number of half edges in this mesh is: 60000
The number of faces in this mesh is: 20000
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 7

- For feline4k.obj

The number of vertices in this mesh is: 4176
The number of half edges in this mesh is: 25068
The number of faces in this mesh is: 8356
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 2

- For gbones.obj

The number of vertices in this mesh is: 2154
The number of half edges in this mesh is: 12612
The number of faces in this mesh is: 4204
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 26
The number of genus in this mesh is: 0

- For mannequin.obj

The number of vertices in this mesh is: 689
The number of half edges in this mesh is: 4086
The number of faces in this mesh is: 1355
The number of boundary loops in this mesh is: 1
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0

- For skull.obj

The number of vertices in this mesh is: 20002
The number of half edges in this mesh is: 120000
The number of faces in this mesh is: 40000
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0

- For sp.obj

The number of vertices in this mesh is: 1000
The number of half edges in this mesh is: 5988
The number of faces in this mesh is: 1996
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0
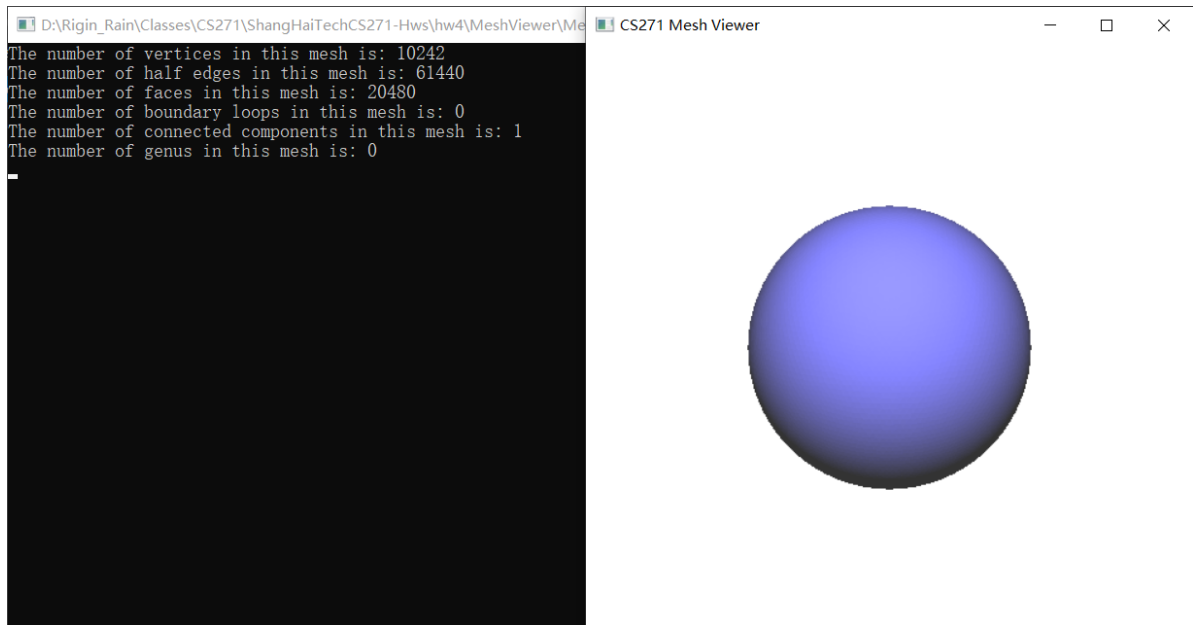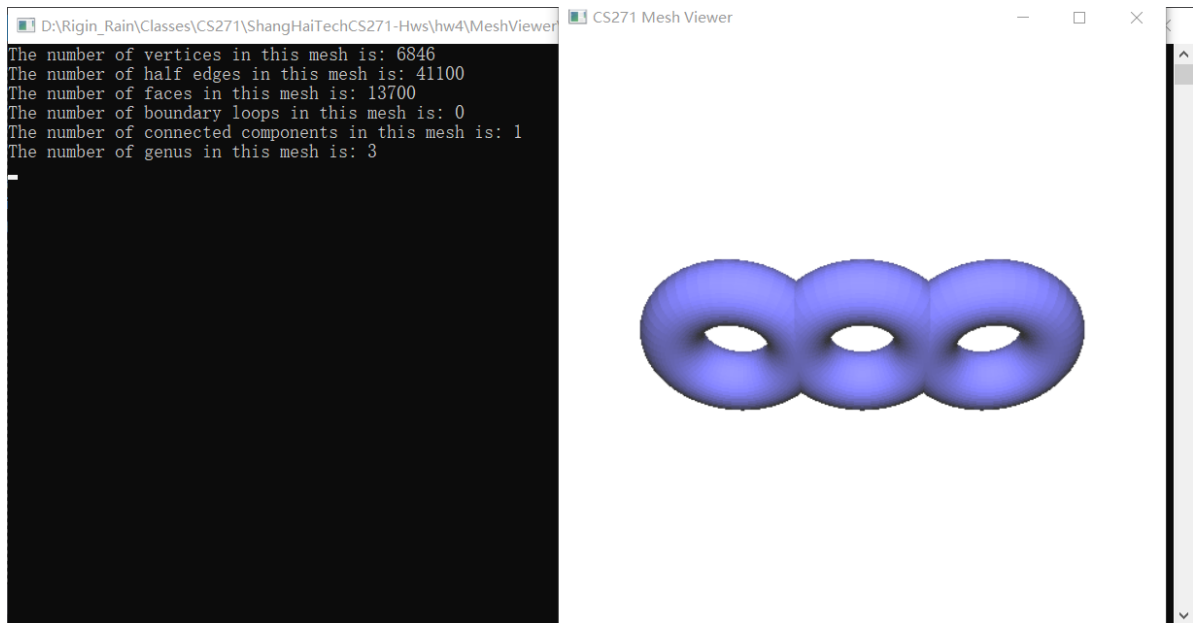
- For sphere.obj

- For torus03.obj

Problem 2: Delete a Vertex

Package and Environment

- The same as problem 1

Instructions

- Run the code as problem 1
- press **2** on keyboard to enter **Selection Mode**
- **Left click mouse button** to select one vertex in the display window, the selected vertex will show in red.
- Press **D** on keyboard to delete one vertex

Output

- The display window will show the result in real time.

Notice

- Since there is no maintenance in vertices' Indices, it is not recommended to delete another vertex.
- Due to not maintaining the vertices's Indices, the menu when right click the mouse is disabled if one vertex is deleted
- Sometimes if scale the view too close, the program will provide error, but this seems to be the bug of the template, just restart the program and be careful when scrolling view

Result (Selected Some rough models (less vertices) for better view)

- Performance on ordinary non-bounding vertex **(mannequin.obj)**
  - As the first two figures, you can see the vertex has been deleted and the layout of the face around the deleted vertex changes to fit the rules
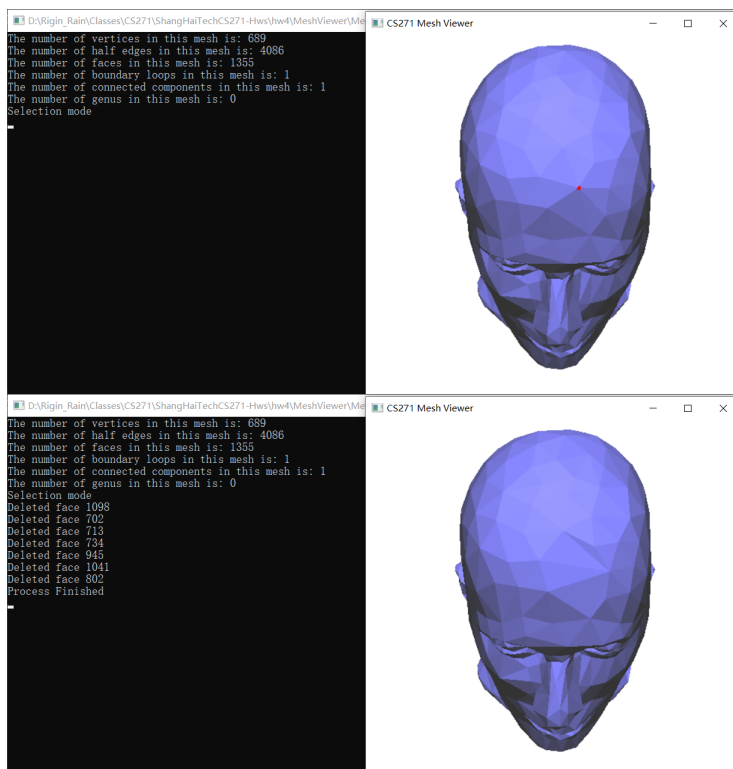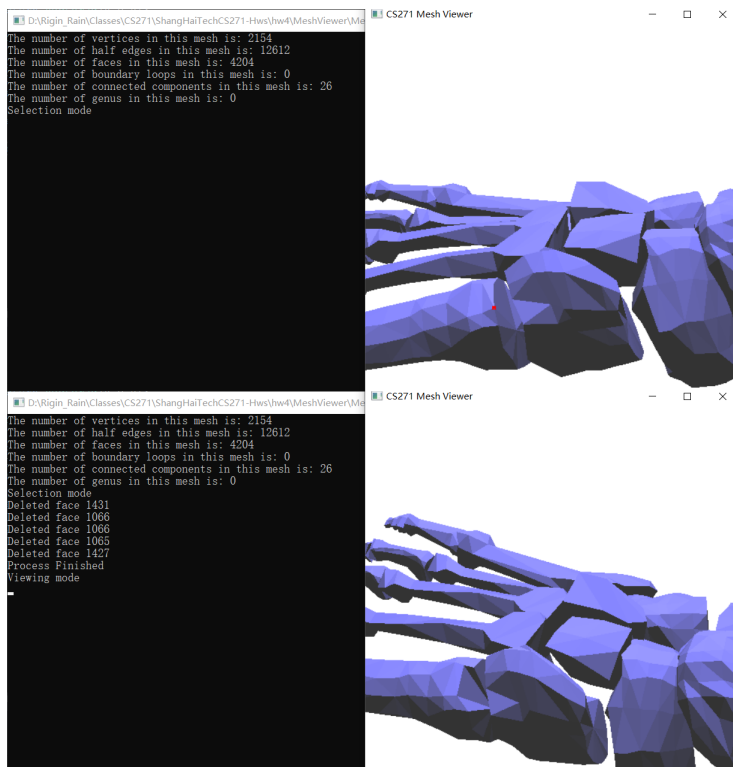

- The following two pictures shows that the program prohibits the second deletion, it also prevents some unintended triggering.
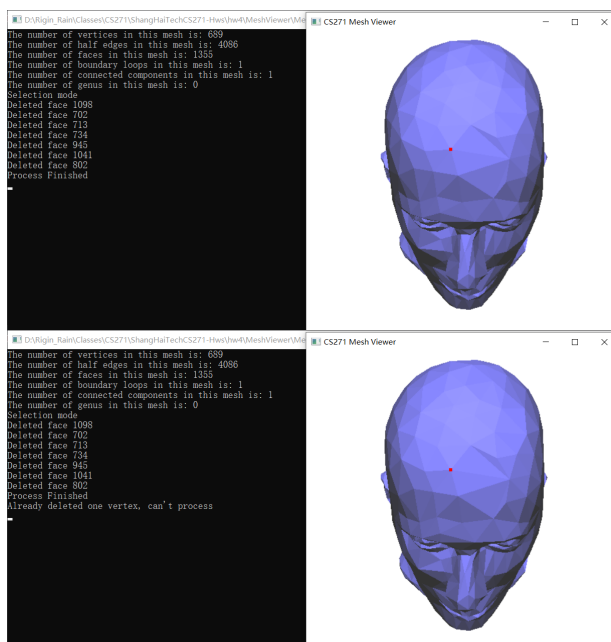
- Performance on ordinary bounding vertex **(mannequin.obj)**
    - As in figures, the corresponding vertex has been deleted, you can see the tiny difference in the way the boundary edge goes

- Performance on non-bounding Edge vertex (sharp corners) **(gbones.obj, atet.obj)**
    - As you can see, even if deleting an sharp corner, the mending of the faces still performs good

The number of vertices in this mesh is: 4
The number of half edges in this mesh is: 12
The number of faces in this mesh is: 4
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0
Selection mode

CS271 Mesh Viewer
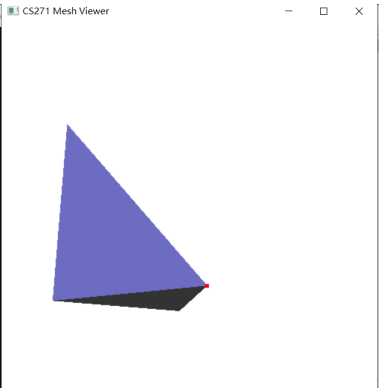
The number of vertices in this mesh is: 4
The number of half edges in this mesh is: 12
The number of faces in this mesh is: 4
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0
Selection mode
Deleted face 3
Deleted face 2
Deleted face 0
Process Finished

CS271 Mesh Viewer

The number of vertices in this mesh is: 4
The number of half edges in this mesh is: 12
The number of faces in this mesh is: 4
The number of boundary loops in this mesh is: 0
The number of connected components in this mesh is: 1
The number of genus in this mesh is: 0
Selection mode